

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference P1595-W0	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 98/ 01074	International filing date (day/month/year) 14/04/1998	(Earliest) Priority Date (day/month/year) 15/04/1997
Applicant CODEALL LTD et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (see Box I).
2. ☐ Unity of invention is lacking (see Box II).
3. ☐ The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing
 - ☐ filed with the international application.
 - ☐ furnished by the applicant separately from the international application,
 - ☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
 - ☐ Transcribed by this Authority
4. With regard to the title, ☒ the text is approved as submitted by the applicant
☐ the text has been established by this Authority to read as follows:
5. With regard to the **abstract**,
 - ☐ the text is approved as submitted by the applicant
 - ☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International Search Report, submit comments to this Authority.
6. The figure of the **drawings** to be published with the abstract is:
Figure No. 1 ☒ as suggested by the applicant. ☐ None of the figures.
☐ because the applicant failed to suggest a figure.
☐ because this figure better characterizes the invention.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/01074

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A63C17/00

According to International Patent Classification(IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A63F A63C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 05931 A (PERLIN RAFAEL) 20 February 1997	1-4, 6-8, 15-17, 19, 23, 24, 26
A	see page 3, line 38 - page 5, line 23; figure 1	5
A	DE 38 29 318 A (BURCZYK MARTIN) 1 March 1990 see column 2, line 25 - column 2, line 31; figures 2-4	7-9
A	WO 93 12846 A (NORDICA SPA) 8 July 1993 see page 6, line 3 - page 6, line 19; figure 4	5-8, 21, 22, 24, 26

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

14 July 1998

Date of mailing of the international search report

24/07/1998

Name and mailing address of the ISA

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NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Feber, L

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/01074

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 402 521 A (MONGEON DOUGLAS R) 6 September 1983 see column 2, line 51 - column 3, line 2; figure 2 ---	10,11,25
A	EP 0 559 179 A (NORDICA SPA) 8 September 1993 see column 3, line 52 - column 4, line 11; figures 1,2 -----	12-14, 18,24,26

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/01074

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 9705931	A	20-02-1997	AU	6653696 A	05-03-1997
DE 3829318	A	01-03-1990	NONE		
WO 9312846	A	08-07-1993	IT	1253667 B	22-08-1995
			AU	3158193 A	28-07-1993
US 4402521	A	06-09-1983	NONE		
EP 0559179	A	08-09-1993	IT	1257517 B	25-01-1996
			CA	2090839 A	05-09-1993

INTERNATIONAL SEARCH REPORT

International application No.

PCT/GB 98/01074

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

A carriage (11) for a roller skate (which term includes skate boards) comprises a body on which a plurality of wheels (18-21) is independently suspended by respective resilient suspension means. In-line (blade) wheels (18-21) are independently mounted on trailing arms (26) rotatably mounted on a body (14) and biased by springs (36) which resist the rotation of trailing arms (26) as the wheels (18-21) move upwards, for example on impact with an obstruction.

MLP37-10
09/403, 205

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P1595-WO	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB98/01074	International filing date (day/month/year) 14/04/1998	Priority date (day/month/year) 15/04/1997
International Patent Classification (IPC) or national classification and IPC A63C17/00		
Applicant CODEALL LTD et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 4 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 09/11/1998	Date of completion of this report 09. 08. 99
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. (+49-89) 2399-0 Tx: 523656 epmu d Fax: (+49-89) 2399-4465	Authorized officer Feber, L Telephone No. (+49-89) 2399 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB98/01074

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-16 as originally filed

Claims, No.:

1-26 as originally filed

Drawings, sheets:

1/5-5/5 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB98/01074

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 8-26
	No: Claims 1-7
Inventive step (IS)	Yes: Claims
	No: Claims 1-26
Industrial applicability (IA)	Yes: Claims 1-26
	No: Claims

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB98/01074

POINT V

The document WO97/05931, cited in the international search report, describes (see especially figure 1) a carriage for a roller skate in which each wheel (40) is independently suspended on the carriage by a resilient suspension (42) which includes means for constraining the wheels to follow a predetermined path with respect to a body of the carriage upon deflection of the resilient suspension, whereby the said path includes a component of motion directed towards the rear of the carriage with respect to the direction of travel thereof, and whereby the constraining means comprise pivoted arms (22) for respectively carrying each wheel, wherein the rest position of each arm can be varied (44,46).

A carriage with all the features defined in independent claims 1 and 6 of the present application is thus already known from the above cited prior art document. These claims do consequently not meet the requirements of Article 33.2 PCT since their subject-matters are not new.

Having regard to dependent claims 2-5 and 7-26, it is pointed out that they relate to minor constructional features which, insofar as not directly disclosed in WO97/05931, appear to relate to obvious modifications thereof. Such features will be selected and used by the man skilled in the art as and when he needs them, without any inventive thought being required (Article 33.2 and 33.3 PCT).

POINT VII

In order to set out more fully the background art usefull for understanding the application, reference should have been made in the description to WO97/05931 cited in the international search report (Rule 5.1(a)ii PCT).

Reference signs in parentheses should have been inserted in the claims to increase their intelligibility (Rule 6.2(b) PCT).

The independent claim(s) should have been properly cast in a two-part form (Rule 6.3(b) PCT).

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P1595-WO	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/GB98/01074	International filing date (day/month/year) 14/04/1998	Priority date (day/month/year) 15/04/1997
International Patent Classification (IPC) or national classification and IPC A63C17/00		
Applicant CODEALL LTD et al.		

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- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
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- VIII ☐ Certain observations on the international application

Date of submission of the demand 09/11/1998	Date of completion of this report 09. 08. 99
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. (+49-89) 2399-0 Tx: 523656 epmu d Fax: (+49-89) 2399-4465	Authorized officer Feber, L Telephone No. (+49-89) 2399 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB98/01074

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☐ the drawings, sheets:

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB98/01074

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	8-26
	No:	Claims	1-7
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-26
Industrial applicability (IA)	Yes:	Claims	1-26
	No:	Claims	

2. Citations and explanations

see separate sheet

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see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB98/01074

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PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

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International application No. PCT/GB 98/ 01074	International filing date (day/month/year) 14/04/1998	(Earliest) Priority Date (day/month/year) 15/04/1997
Applicant CODEALL LTD et al.		

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 - ☐ Transcribed by this Authority
4. With regard to the title, ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:
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 - ☐ the text is approved as submitted by the applicant
 - ☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this International Search Report, submit comments to this Authority.
6. The figure of the drawings to be published with the abstract is:
Figure No. 1 ☒ as suggested by the applicant. ☐ None of the figures.
☐ because the applicant failed to suggest a figure.
☐ because this figure better characterizes the invention.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/GB 98/01074

Box III TEXT OF THE ABSTRACT (Continuation of Item 5 of the first sheet)

A carriage (11) for a roller skate (which term includes skate boards) comprises a body on which a plurality of wheels (18-21) is independently suspended by respective resilient suspension means. In-line (blade) wheels (18-21) are independently mounted on trailing arms (26) rotatably mounted on a body (14) and biased by springs (36) which resist the rotation of trailing arms (26) as the wheels (18-21) move upwards, for example on impact with an obstruction.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/01074

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A63C17/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A63F A63C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 05931 A (PERLIN RAFAEL) 20 February 1997	1-4, 6-8, 15-17, 19, 23, 24, 26
A	see page 3, line 38 - page 5, line 23; figure 1	5
A	--- DE 38 29 318 A (BURCZYK MARTIN) 1 March 1990 see column 2, line 25 - column 2, line 31; figures 2-4	7-9
A	--- WO 93 12846 A (NORDICA SPA) 8 July 1993 see page 6, line 3 - page 6, line 19; figure 4	5-8, 21, 22, 24, 26
	--- -/--	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

14 July 1998

Date of mailing of the international search report

24/07/1998

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Feber, L

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/01074

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 402 521 A (MONGEON DOUGLAS R) 6 September 1983 see column 2, line 51 - column 3, line 2; figure 2 ----	10, 11, 25
A	EP 0 559 179 A (NORDICA SPA) 8 September 1993 see column 3, line 52 - column 4, line 11; figures 1, 2 -----	12-14, 18, 24, 26

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/01074

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 9705931	A	20-02-1997	AU	6653696 A	05-03-1997
DE 3829318	A	01-03-1990	NONE		
WO 9312846	A	08-07-1993	IT	1253667 B	22-08-1995
			AU	3158193 A	28-07-1993
US 4402521	A	06-09-1983	NONE		
EP 0559179	A	08-09-1993	IT	1257517 B	25-01-1996
			CA	2090839 A	05-09-1993

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

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in its capacity as elected Office

Date of mailing (day/month/year) 26 March 1999 (26.03.99)	
International application No. PCT/GB98/01074	Applicant's or agent's file reference P1595-WO
International filing date (day/month/year) 14 April 1998 (14.04.98)	Priority date (day/month/year) 15 April 1997 (15.04.97)
Applicant BRIDGES, Norman	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:09 November 1998 (09.11.98)☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Lazar Joseph Panakal

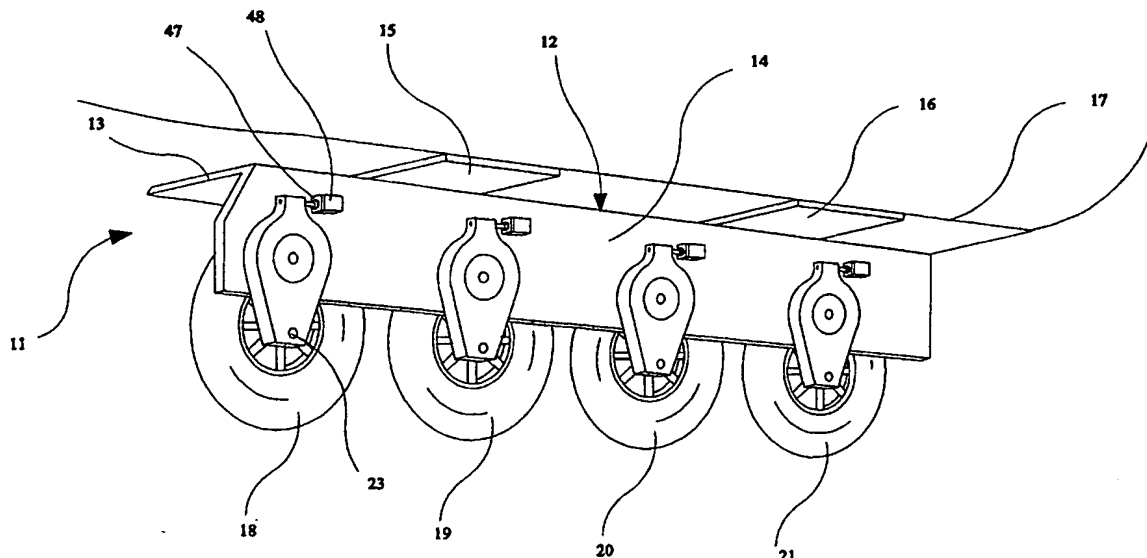
Telephone No.: (41-22) 338.83.38



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A63C 17/00	A1	(11) International Publication Number: WO 98/46317 (43) International Publication Date: 22 October 1998 (22.10.98)
(21) International Application Number: PCT/GB98/01074 (22) International Filing Date: 14 April 1998 (14.04.98) (30) Priority Data: 9707577.4 15 April 1997 (15.04.97) GB 9802474.8 6 February 1998 (06.02.98) GB (71) Applicant (for all designated States except US): CODEALL LTD. [GB/GB]; 14 Dunstanville Terrace, Greenbank, Falmouth, Cornwall TR11 2SW (GB). (72) Inventor; and (75) Inventor/Applicant (for US only): BRIDGES, Norman [GB/GB]; 1 Hollywell Court, Playing Place, Truro, Cornwall TR3 6EY (GB). (74) Agent: BRYER, Kenneth, Robert; K.R. Bryer & Co., 7 Gay Street, Bath BA1 2PH (GB).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>

(54) Title: A CARRIAGE FOR A ROLLER SKATE



(57) Abstract

A carriage (11) for a roller skate (which term includes skate boards) comprises a body on which a plurality of wheels (18-21) is independently suspended by respective resilient suspension means. In-line (blade) wheels (18-21) are independently mounted on trailing arms (26) rotatably mounted on a body (14) and biased by springs (36) which resist the rotation of trailing arms (26) as the wheels (18-21) move upwards, for example on impact with an obstruction.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
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DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

A CARRIAGE FOR A ROLLER SKATE

The present invention relates generally to a carriage for a roller skate and to a roller skate incorporating such a carriage.

As used in this specification the term "roller skate" will be understood not only to refer to a fitting adapted to be worn on the foot of a user, and having a plurality of wheels or rollers by which the wearer can roll or "skate" over the ground, but also to a skate having a platform mounted on a plurality of wheels and commonly referred to as a skateboard. The term "skate" will hereinafter be used to refer to both boot type and board type skates. Two main roller skate configurations are known, namely a traditional roller skate comprising two pairs of wheels in fore and aft pairs with each pair being mounted for rotation about a common axis, often on a common axle, on a skate body or board: indeed skateboards almost all have such a wheel configuration for reasons of stability. Each pair of wheels is referred to as a "truck" and such skates will therefore hereinafter be referred to as "truck" skates. More recently skates having a plurality of wheels in a single row individually mounted on a support so as to be in-line with one another have been introduced. Such skates provide rolling contact with the ground similar in many respects to the sliding contact of an ice skate. The

carriage of such a skate is usually surmounted by a boot with secure ankle straps by which the user's foot can effectively be connected to the wheels. Having a plurality of wheels in an in-line configuration gives
5 such skates an appearance resembling that of an ice skate with the wheels taking the place of an ice skate blade and, for that reason, such skates are often known as "roller blades" and hereinafter will be referred to as "blade" type skates.

10

Whatever the wheel configuration all roller skates need smooth surfaces on which to roll in order to perform properly because the wheels or rollers are of relatively small diameter which cannot surmount large obstructions.

15

Roller skates cannot be used to roll over rough surfaces such as cobble stones and even coarse tarmac presents problems because the vibration caused thereby is disagreeable to the user. For this reason such irregular
20 surfaces are avoided. Skate manufacturers try to overcome the disadvantages of running over irregular surfaces as much as possible. Truck type skates frequently have resilient blocks between the individual trucks and the carriage or plate by which they are
25 secured to a wearer's shoe, or a boot incorporated in the skate, such resilient blocks acting in compression or in shear to absorb a minor part of the roughness of irregular surfaces. Further attempts to absorb such

irregularities and made in the choice of material used for the wheels themselves. Commonly the outer peripheral portion of the wheels is made from an elastomeric material, especially polyurethane, which has a good
5 resistance to abrasion and wear whilst at the same time providing a degree of resilience which helps to absorb minor imperfections in the surface.

All these attempts, however, provide only a very limited
10 capability to absorb irregularity or roughness in the surface over which the skate passes and none have successfully managed to provide means by which large irregularities can be absorbed. In this context "large" in terms of the irregularity of a surface may mean
15 surface asperities of the order of several centimetres, such as may be experienced on cobbled surfaces or very coarse tarmac, paving slabs, gravel or the like.

The present invention seeks to overcome the disadvantages
20 of prior art roller skates by providing a roller skate carriage having means by which relatively large (as herein defined) excursions of the wheels can be made independently with respect to the roller skate carriage whereby to allow the carriage itself to move relatively
25 smoothly over the surface.

According to one aspect of the present invention, therefore, there is provided a carriage for a roller

skate in which each wheel is independently suspended on the carriage by a resilient suspension which includes means for constraining the wheel to follow a predetermined path with respect to a body of the carriage
5 upon deflection of the resilient suspension, wherein the said path includes a component of motion directed towards the rear of the carriage with respect to the direction of travel thereof.

10 In this context a resilient suspension is to be understood to include any means by which a wheel may be secured to a roller skate carriage in such a way that movements of the wheel towards or away from the carriage in a range of directions generally transverse the
15 direction of movement of the roller skate carriage in use.

In a preferred embodiment of the invention a roller skate carriage as herein above defined is provided with a
20 resilient suspension for each wheel including means for constraining the wheel to follow a predetermined path with respect to a body of the carriage upon deflection of the resilient suspension. Such constraining means may, for example, comprise one or more trailing arms for each
25 wheel. The position of a trailing arm is of particular interest since it can be arranged, with such a structure, that the wheel encountering an obstruction may move rearwardly as well as upwardly in relation to a roller

skate carriage in a normal upright orientation of use, in order to accommodate the impact with the obstruction. In this way each individual wheel may roll over an obstruction without causing the other wheels to be
5 disturbed from their normal position and without causing the carriage to move from the horizontal plane in which it is travelling.

The present invention is equally applicable to blade type
10 roller skates as to truck type roller skates and the wheels of a roller skate carriage formed as an embodiment of the present invention may be arranged in line with one another along the body of the carriage in a single row, or may be arranged in coaxial pairs on the body of the
15 carriage.

The suspension for each wheel may include a resilient member acting both to exert a resilient biasing force urging the wheel towards one end of its path of suspended
20 travel with respect to the carriage and as a wheel guide member at least partly defining the path travel of the wheel. Such resilient member may be a leaf spring. Alternatively, the resilient action of the suspension may be exerted by a compression spring and in one embodiment
25 the compression spring is a coil spring which may be made of metal or plastics. Alternatively, a compression spring formed as a chamber of compressible gas having a piston sealingly displaceable within it may act as the

resilient member of the suspension.

Other forms of resilient member for the suspension may include torsion springs which, in particular, may be a
5 coil spring acting in torsion.

If leaf springs are employed these may be elliptical or semi-elliptical leaf springs or a generally U-shape leaf secured by one limb to the carriage and carrying the
10 wheel on another limb thereof.

Whatever the form of the resilient member of the suspension it is envisaged that the resilient suspension of each wheel will be substantially undamped although
15 frictional or fluid damping of the motion of a spring member (whether it is a mechanical or a compressed gas spring) may be provided without departing from the scope of the present invention.

20 Again, regardless of the form of the resilient member of the suspension, embodiments of the present invention may be formed in which the path of movement of a wheel upon displacement of the suspension is non-linear. Such non-linearity may include a variation in the direction of
25 travel of a wheel with variation in the magnitude of the excursion from a static load position.

In embodiments of the invention in which the path of the

wheels upon displacement of the suspension is constrained by a trailing arm, the wheels may be carried by respective pivoted trailing arms pivotally mounted for rotation about respective axes substantially parallel to
5 the axis of rotation of the wheel carried thereby.

Each said pivoted trailing arm may house a respective coil spring urging the arm to turn in a first direction about its pivot axis with respect to the carriage body.

10

For practical convenience it is preferred that the resilient suspension force acting on each wheel is independently adjustable by respective adjustment means. It is always possible, of course, for the wheels to be
15 linked together so that the individual independent suspensions are operated together.

The adjustment of the resilient suspension force may be effected by adjustment of the angular position of a
20 locating member held in place by frictional engagement with a fixed part of the carriage or a member carried thereby.

At the other end of its range of movement from the full-
25 deflection position of the resilient suspension member there may be provided abutment stops on the body of the carriage, engaged by a moveable part of the suspension whereby to extend the maximum extension travel of a wheel

suspension.

Such abutment stops are preferably adjustable whereby to adjust the said maximum extension position of a wheel.

5

Whatever the form of the skate carriage, that is whether it is a blade type or a truck type roller skate, the body of the carriage may include or comprise at least one elongate plate-like member on which a plurality of individual wheel suspensions are carried. A single such plate-like member may be provided for a blade type roller skate in which the wheels are mounted in line with one another although two such plates may be provided with each wheel having two connecting linkages to the wheel axle. If this is the case one or both such linkages may include resilient biasing means.

Various embodiments of the present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a schematic perspective view of a roller skate carriage formed as a first embodiment of the present invention;

Figure 2 is a schematic exploded perspective view of a suspension assembly for one wheel of the embodiment of Figure 1;

Figure 3 is a front view from one end of the roller skate carriage of Figure 1;

Figure 4 is a similar front view of a second embodiment of the present invention;

Figure 5 is an exploded perspective view of a suspension assembly suitable for use in the embodiment of
5 Figure 4; and

Figure 6 is a schematic view from one side of the suspension assembly of Figure 5 showing two ends of its range of movement.

10 Referring first to Figure 1 there is shown a roller skate carriage of the "blade" type generally indicated 11 suitable for attachment to a boot (illustrated schematically, but not referenced) of a wearer.

15 The body of the carriage 11 comprises an L-section main member generally indicated 12 having, in the orientation of use illustrated in Figure 1, an horizontal flange 13 and a vertical flange 14. The horizontal flange 13 is secured by bolts (not shown) to intermediate plates 15,
20 16 in turn secured to the boot (not shown) of the roller skate, represented by the single line 17 in Figure 1.

Suspended from the vertical flange 14 of the carriage body 12 are four wheels 18, 19, 20, 21 which are all
25 identical to one another: the wheels 18-21 are carried on respective transverse axles parallel to one another and perpendicular to the plane of the flange 14 such that the wheels 18-21 are in line for common rolling motion.

The suspension by which each wheel 18-21 is suspended from the carriage 12 is identical for each wheel, and therefore only one such suspension, namely that for the wheel 18, will be described in detail with reference to
5 Figures 1, 2 and 3.

The wheel 18 is of a known type for unsprung roller blade type roller skates having a polyurethane outer perimetral "torus" and a central hub incorporating bearings which
10 can be mounted, as seen in Figure 2, on a fixed axle 22 having a spacer sleeve 23 of larger diameter defining with the axle 22 an annular shoulder 24. A free end of the axle 22 has an axial threaded hole 25 to receive a screw 26 by which the wheel 18 is secured to the axle 22
15 with its bearing (not shown) abutting against the shoulder 24. The axle 22 is fixedly secured by means (not shown) in a hole in an arm 26 which is pivotally mounted on the flange 14 in a manner which will be described hereinafter.

20

The arm 26 is a lobe of a body 27 of generally circular shape having an annular channel 28 in one face 29 thereof surrounding a central cylindrical boss 30 having a through hole 31 passing through it. The annular channel
25 28 has a bottom wall 32 formed as a web of the body 27. A hole 33 is formed in the bottom wall 32 for purposes which will be described in more detail below. Housed in the central cylindrical opening 31 in the boss 30 is a

generally cylindrical mount 34 having a terminal radial flange 35 at one end and a threaded axial hole 36 at the other. The length of the cylindrical body portion of the mount 34 is slightly greater than the thickness of the body 27 such that when introduced into the hole 31 an end face 360 of the mount 34, bearing the threaded hole 36, projects a few thousandths of a millimetre beyond the end face 36 of the cylindrical boss 30.

10 A coiled helical wire spring 37 of two complete turns is housed in the channel 28. The ends of the coil spring 37 are each bent axially to form engagement pins 38, 39 the former of which engages in the hole 33 in the bottom of the channel 28. The other engagement pin engages in a hole 40 of a cover disc 41 which, when the unit is assembled as illustrated in Figure 3, lies between the body 27 and the vertical flange 14 of the carriage body. The disc 41 has a central hole 42 through which passes a screw 43 which is threaded into the threaded hole 36 of the mount 34. In Figure 2 the flange 14 is represented by the small section thereof illustrated only for clarity. As the screw 43 is tightened it draws the cylindrical mount 34 through the cylindrical opening 31 of the boss 30 to press the cover disc 41 tightly against the flange 14. Because the cylindrical body 34 is longer than the thickness of the body 27 this latter is free to rotate on the mount 34 whereas the cover disc 41 is clamped securely by friction against the flange 14. The spring

37 can be pre-tensioned by appropriately orientating the disc 41 which, as can be seen in Figure 3, projects slightly below the lower edge of the flange 14 for this purpose. Once this adjustment has been made, however, it is possible to effect readjustment only with difficulty, by first removing the wheel 18.

The orientation of the body 27 in relation to the vertical about an axis passing through the centre of the cylindrical boss 30, can be varied by adjusting a threaded stop screw 44 which passes through a threaded opening in a lug 45 on the diametrically opposite part of the body 27 from the arm 26 which carries the wheel 18. The screw 44 has an enlarged head 46 which can engage a resilient pad 47 carried on an abutment block 48 secured to the flange 14. As illustrated in Figure 1 the arm 26 is orientated such that the line joining the axis of the wheel spindle 22 and the axis about which the body 27 rotates is substantially vertical; this is not necessarily a working position but has been shown for clarity of illustration. This can be adjusted to a rearward inclination by turning the head 46 of the screw 44 by means of a suitable open key.

The embodiment of Figures 1 to 3, as is most clearly seen from Figure 3, is asymmetrical although it is anticipated that the structural components will be easily formed such as to be adequately strong to resist the forces exerted

on them in use. This is sufficient for general skating purposes. If, for special purposes greater strength is required a configuration such as that shown in Figure 4 may be employed in which the wheel 18 is carried on a spindle 22 (provided within spacers 230) which projects to both sides of the wheel and is carried on respective arms 26, 26' pivotally carried on respective flanges 47, 48 of respective T-section carriers 49, 50 the upper cross arms 51, 52 of which are secured to a base plate 53 for attachment to a boot 54. The wheel mounting configuration of Figure 4 offers greater symmetry to resist stresses exerted on the axles 22 by the wheel 18 at the expense of additional material and therefore greater weight.

15

Figure 5 is an exploded view illustrating an alternative structure for the arm 26 which is employed in the embodiment of Figure 4. It has the advantage over the support arm structure of Figure 2 that the biasing spring force can be adjusted from an external point by a user thereby enabling the user to vary the spring forces in play depending on the intended use and/or the user's weight.

25 Referring now to Figure 5 those components which are substantially the same as, or fulfil the same function as, corresponding components in the support arm of Figure 2 have been identified with the same reference numerals.

Thus, the wheel 18 has a spindle 22 carried in a hole 55 formed in an arm 26 of a suspension body 29. A grub screw 56 engaged in a threaded hole at the end of the arm 26 which is not visible in Figure 5 locates the spindle 22 and secures it in position. A collar or spacer sleeve 220 spaces the wheel 18 from the arm 26.

In this embodiment the body 29 is carried on the flange 14 (schematically as shown in Figure 5) in the opposite orientation from that in which the corresponding body is located on the flange 14 in Figure 2. In other words, the channel 28 of the body 29 faces away from rather than towards the flange 14. In this embodiment the hole 36 through the cylindrical mount 34 is plain rather than threaded so that the screw 43 can pass through it without being threaded into it. Upon assembly, therefore, the screw 43 is passed through a washer 58 and then through the flange 14 and held in position while the mount 34 is positioned over it. The mount 34 is then introduced into the opening 31 in the boss 30 by fitting the arm 29 over the mount 34 and the spring 36 is introduced into the channel 28 with the end pin 38 located in the hole 33. The cover washer 41 is then fitted over the screw 43 with its hole 40 engaged on the pin 39 of the coil spring 36, and a nut 57 is screwed onto the screw 43. Because the cylindrical mount 34 is longer than the thickness of the body 29 the plate 41 is drawn onto the end face 34a of the mount 34 and is clamped fixedly in position in

relation to the flange 14. The body 29, on the other hand, can rotate about the axis defined by the screw 43 with respect to the flange 14. Such movement coils or uncoils the spring 36 and an appropriate pretension can be applied by slackening the nut 57, turning the disk 41 clockwise or anticlockwise as appropriate, holding the disk 41 in the adjusted position and retightening the nut 57 to clamp it tightly against the end face 34a of the boss 34.

10

The body 29 also has an abutment 45 which, like the embodiment of Figure 2 is provided with an adjusting screw which, however, is not shown in Figure 5 for simplicity.

15

Referring now to Figure 6 it will be seen that the arm 26 can be set to an inclined position (that is a position in which the line joining the pivot axis of the body 29 defined by the screw 43, and the axis about which the wheel 18 rotates, defined by the hole 55) is inclined to the vertical by a small angle such that a downward load on the boot (or an upward load from an obstruction on the ground as the skate rolls over it) can cause the arm 26 to rotate about the pivot axis from the position shown in solid outline in Figure 6 to the position shown in broken outline in this figure. The direction of advance of the roller skate is represented by the arrow A. Fine adjustments to the inclination of the arm 26 can be made

by adjusting the screw 44 the end of which engages against the pad 47 of the abutment block 48.

In use of the roller skate of the invention, therefore,
5 as the user passes over obstructions the impact can be absorbed by the rocking of the arm 26 about its pivot axis. Moreover, by suitable selection of the spring rates and their adjustment, a skater can arrange that when pressing downwardly to push off during the skating
10 action, all the wheels can be depressed concurrently so that the energy stored in the springs by this action can be utilised upon extension of the springs to enhance the force exerted by the skater and improve his performance.

15 It is to be understood that the embodiments described alone are susceptible of modification and variation without departing from the ambit of the invention as defined in the following claims. For example, the coil springs could be replaced by springs of other form, such
20 as torsion or shear springs for example those known as "silentbloc" springs comprising annular bushes bonded to the radially outer and inner surfaces of two relatively rotatable components such as the arm 26 and the flange
14.

CLAIMS

1. A carriage for a roller skate in which each wheel is independently suspended on the carriage by a resilient suspension which includes means for constraining the wheel to follow a predetermined path with respect to a body of the carriage upon deflection of the resilient suspension, wherein the said path includes a component of motion directed towards the rear of the carriage with respect to the direction of travel thereof.

2. A roller skate carriage as claimed in Claim 1, in which the path of movement of a wheel upon displacement of the suspension is non-linear.

3. A roller skate carriage as claimed in any preceding Claim, in which the path of the suspension travel of a wheel varies in direction with a variation in the magnitude of the excursion from a static load position.

4. A roller skate carriage as claimed in any of Claims 1, 2 or 3, in which the said constraining means comprise one or more trailing arm for respectively carrying each wheel.

5. A roller skate carriage as claimed in Claim 4, wherein the orientation of each trailing arm in its rest position can be varied.

6. A carriage for a roller skate in which each wheel is independently suspended on the carriage by a resilient suspension, which resilient suspension includes means for constraining the wheel to follow a predetermined path with respect to a body of the carriage upon deflection of the resilient suspension, in which the constraining means comprise one or more pivoted arm for respectively carrying each wheel, wherein the next position of each arm can be varied.

10

7. A roller skate carriage as claimed in any preceding claim, in which the resilient action of the suspension is exerted by a compression spring.

15 8. A roller skate carriage as claimed in Claim 7, in which the compression spring is a coil of metal or plastics.

9. A roller skate carriage as claimed in Claim 7, in which the compression spring is a chamber of compressed gas having a piston sealingly displaceable within it.

10. A roller skate carriage as claimed in any of Claims 1 to 6, in which the resilient suspension includes a leaf spring.

25

11. A roller skate carriage as claimed in Claim 10, in which the leaf spring is generally U-shape and the wheel

is carried by one arm thereof via an axle and a bearing permitting the wheel to rotate with respect to the leaf spring.

5 12. A roller skate carriage as claimed in any of Claims 1 to 6, in which the resilient action of the suspension is exerted by a torsion spring.

10 13. A roller skate carriage as claimed in any one of Claims 1 to 6 or 12, wherein the torsion spring is a coil spring in torsion.

15 14. A roller skate carriage as claimed in Claim 13, wherein the torsion spring is a helical or spiral coil spring.

20 15. A roller skate carriage as claimed in any preceding claim, in which the suspension for each wheel includes a resilient member acting both to exert a resilient biasing force urging the wheel towards one end of its path of suspended travel with respect to the carriage and as a wheel guide member at least partly defining the path of travel of the wheel.

25 16. A roller skate carriage as claimed in any preceding claim, in which the resilient suspension of each wheel thereof is substantially undamped.

17. A roller skate carriage as claimed in any preceding claim, in which the wheels are carried by respective pivoted trailing arms mounted for rotation about respective axes pivoting substantially parallel to the
5 axis of rotation of the wheel carried thereby.

18. A roller skate carriage as claimed in Claim 17, in which each said pivoted trailing arm houses a respective torsion spring urging the arm to turn in a first
10 direction about a first axis with respect to the carriage body.

19. A roller skate carriage as claimed in any preceding claim, in which the resilient force acting on each wheel
15 is independently adjustable by respective adjustment means.

20. A roller skate carriage as claimed in Claim 19, in which the adjustment of the resilient suspension force is
20 effected by adjustment of the angular position of a locating member held in place by frictional engagement with a fixed part of the carriage or a member carried thereby.

25 21. A roller skate carriage as claimed in any preceding claim, in which there are provided abutment stops on the body of the carriage, engaged by a movable part of the suspension whereby to determine the maximum excursion

travel of a wheel suspension.

22. A roller skate carriage as claimed in Claim 21, in which the said abutment stops are adjustable whereby to
5 adjust the said maximum excursion position of a wheel.

23. A roller skate carriage as claimed in any preceding claim, in which the body of the carriage includes or comprises at least one elongate plate-like member on
10 which a plurality of individual wheel suspensions are carried with the wheels in-line with one another.

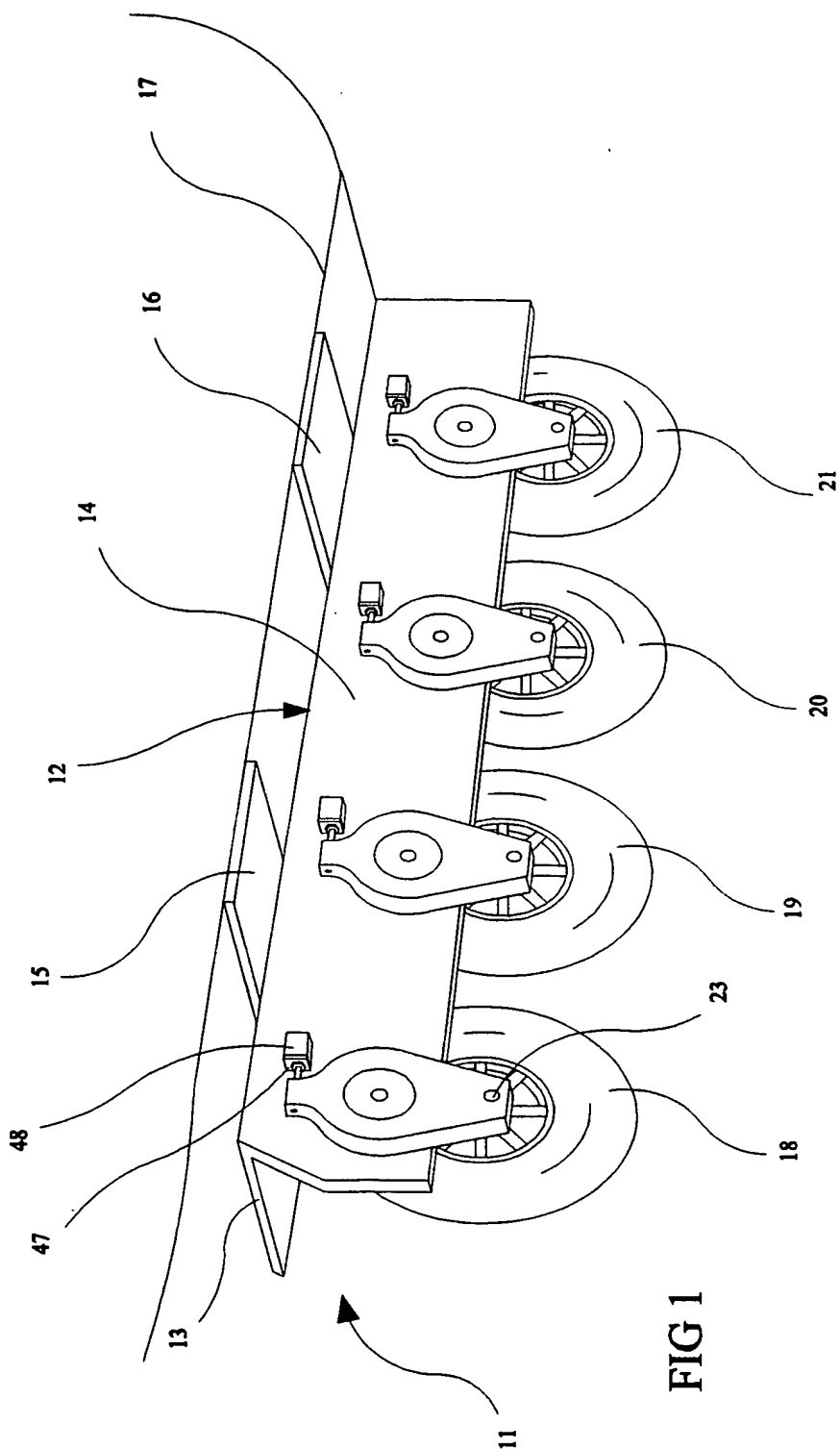
24. A roller skate carriage as claimed in any preceding claim, in which the wheels are arranged in-line with one
15 another along the body of the carriage in a single line.

25. A roller skate carriage as claimed in any of Claims 1 to 24, in which the wheels are arranged in co-axial pairs on the body of the carriage.

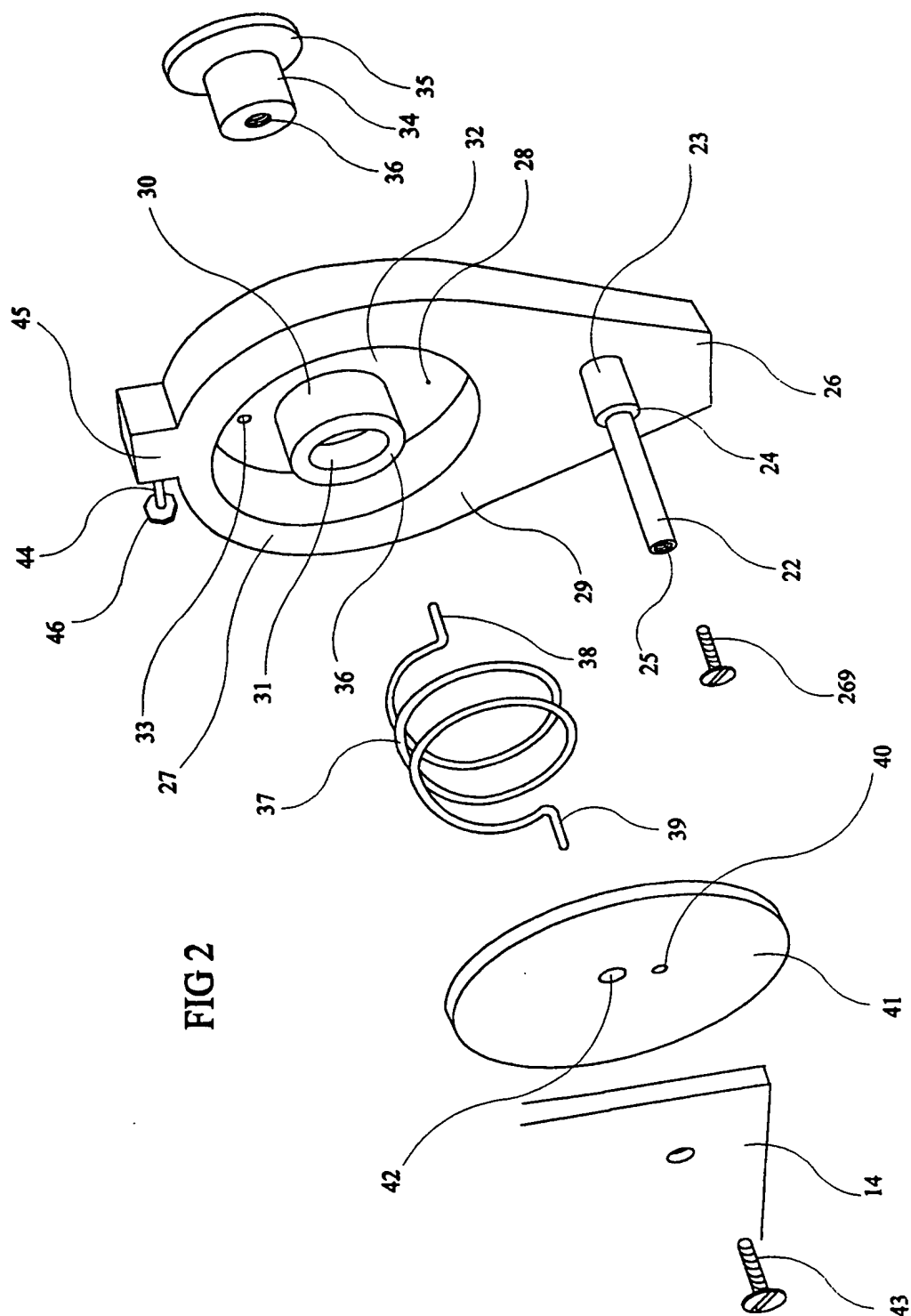
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26. A roller skate comprising a carriage as claimed in any preceding claim, secured fixed and attached to a boot for receiving and supporting the foot of a user.

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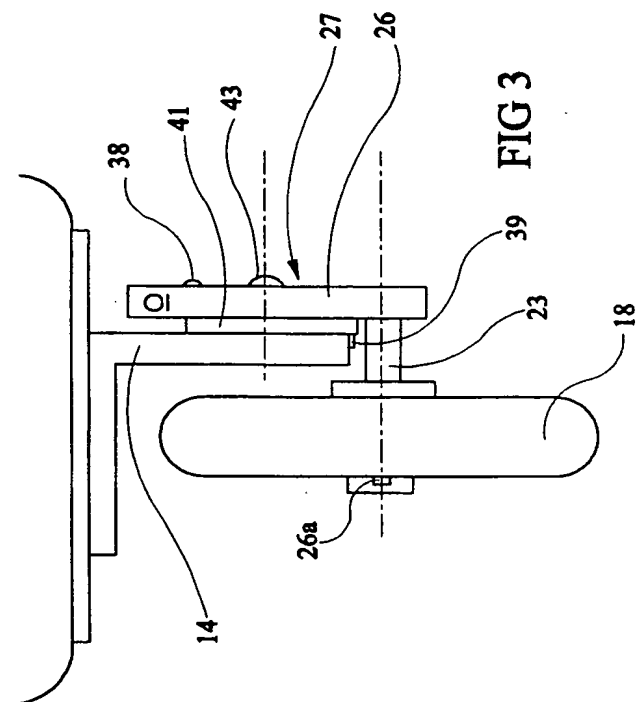


FIG 3

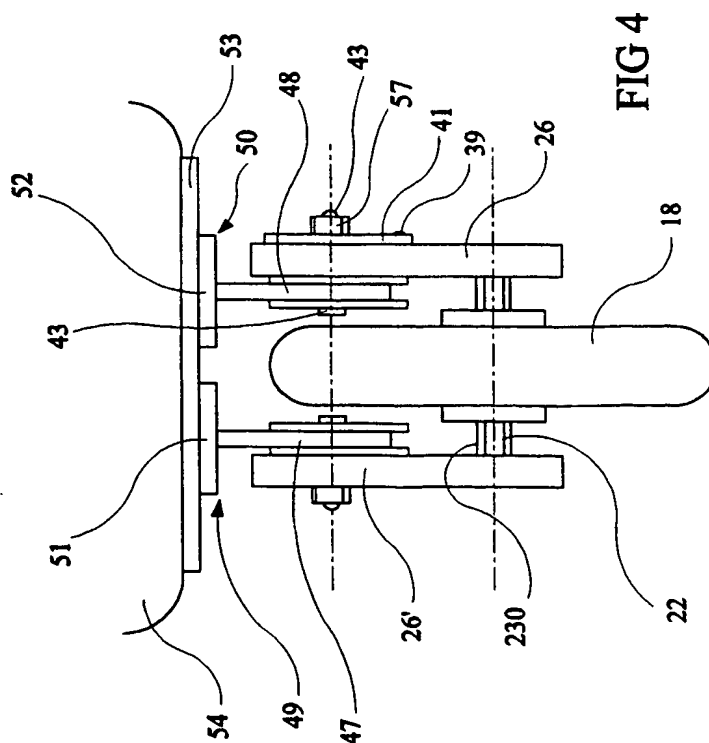


FIG 4

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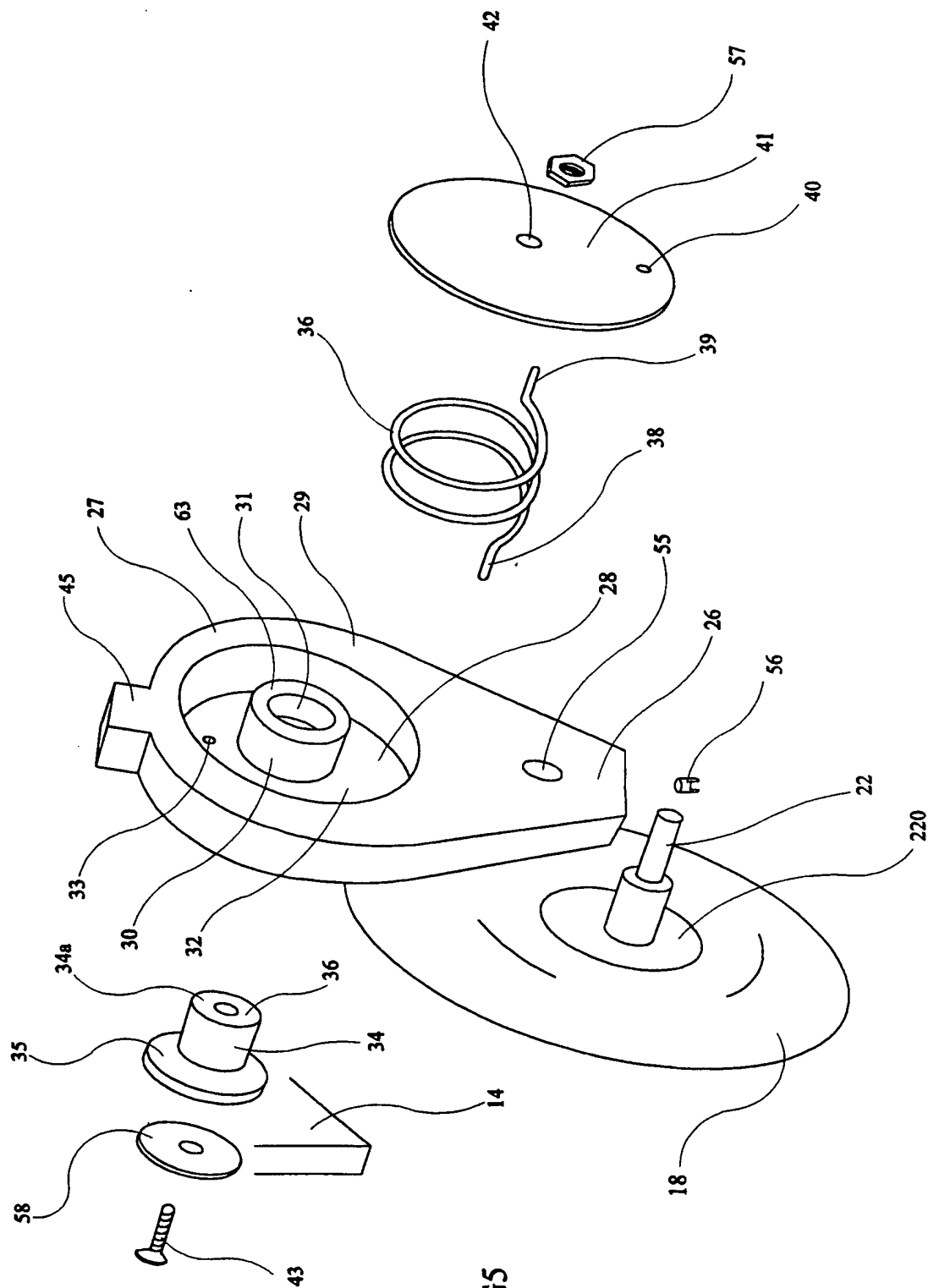
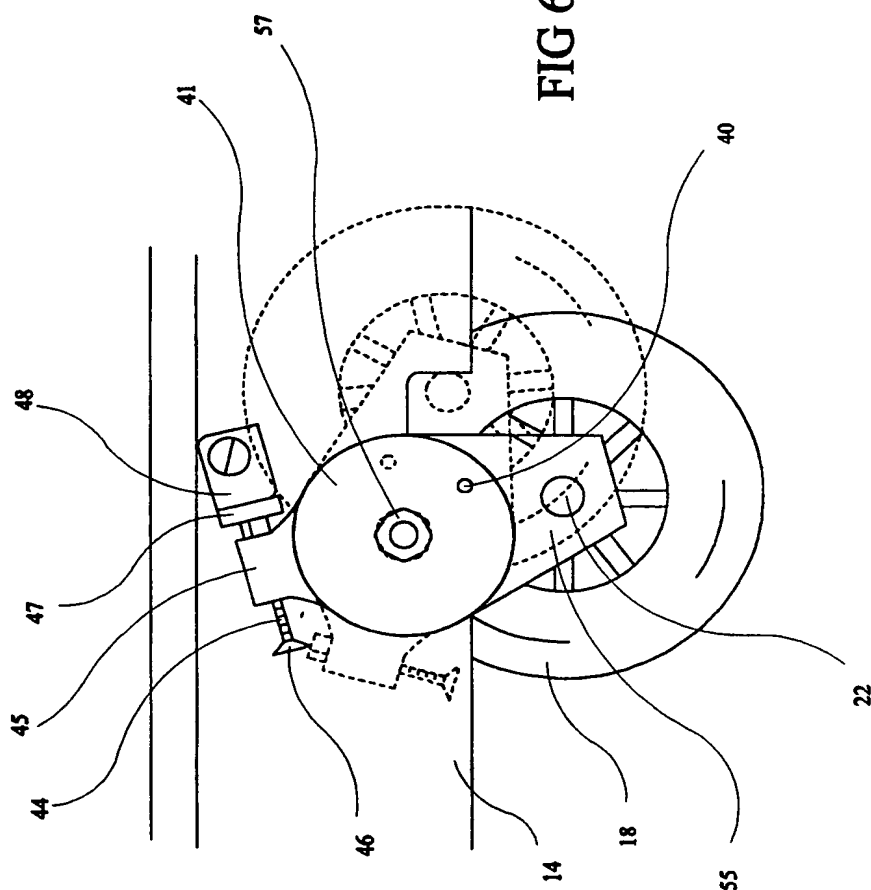


FIG5

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FIG 6



INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/01074

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A63C17/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A63F A63C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 05931 A (PERLIN RAFAEL) 20 February 1997	1-4, 6-8, 15-17, 19, 23, 24, 26
A	see page 3, line 38 - page 5, line 23; figure 1	5
A	DE 38 29 318 A (BURCZYK MARTIN) 1 March 1990 see column 2, line 25 - column 2, line 31; figures 2-4	7-9
A	WO 93 12846 A (NORDICA SPA) 8 July 1993 see page 6, line 3 - page 6, line 19; figure 4	5-8, 21, 22, 24, 26
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

Special categories of cited documents:

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"E" earlier document but published on or after the international filing date
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"&" document member of the same patent family

Date of the actual completion of the international search

14 July 1998

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INTERNATIONAL SEARCH REPORT

Int. l. Application No

PCT/GB 98/01074

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 402 521 A (MONGEON DOUGLAS R) 6 September 1983 see column 2, line 51 - column 3, line 2; figure 2 -----	10,11,25
A	EP 0 559 179 A (NORDICA SPA) 8 September 1993 see column 3, line 52 - column 4, line 11; figures 1,2 -----	12-14, 18,24,26

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/01074

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US 4402521	A	06-09-1983	NONE	
EP 0559179	A	08-09-1993	IT 1257517 B CA 2090839 A	25-01-1996 05-09-1993